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THE WORLD'S FOOD SUPPLY

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The number of staple foods as distinguished from the luxuries that constitute the world's dietary are comparatively few. Many thousands of articles make up man's food, but a few form his chief dependence. Standing far at the head of the list are the grains—rice, wheat, millet, rye and barley. Whether measured by bulk of production, the food energy they contain, or the amount that enters international trade, these five grains, together with corn, oats and beans, are the chief food dependence of man. Sugar occupies a very high place as a food for nearly all peoples. Of the vegetables, the potato is exceedingly important, especially in the western world, but, although very great in bulk, its food value is much less than the grains and sugar. Fruits and nuts are of still less importance as staple articles of vegetable diet. Tea, coffee and cocoa are luxuries rather than vital elements in the world's food supply.

Meat, compared with vegetable products, stands surprisingly low in food value and in importance to most of the human race. Over one-half of the people of the earth eat very little meat. Only in new countries, where land is cheap, or in countries like those of western Europe where meats and animal fodder can be readily imported, are meat-producing animals so abundant that they are of large importance as a food. Even in this latter case, the consumption is small compared to countries like Argentina or the United States.¹ The world production of meat—beef, pork and mutton—is only one-fifth of the world's tonnage of wheat, and the food value less than any of the important grains, sugar or potatoes. If dairy products—milk, butter and cheese—are added to the meat products, the importance of animals as a source of food is much greater. The money value of dairy products in the United States, for example, is higher than the money value of the edible grains, and the energy value of these concentrated foods ranks high. With the

¹ See Figure 9, p. 26.

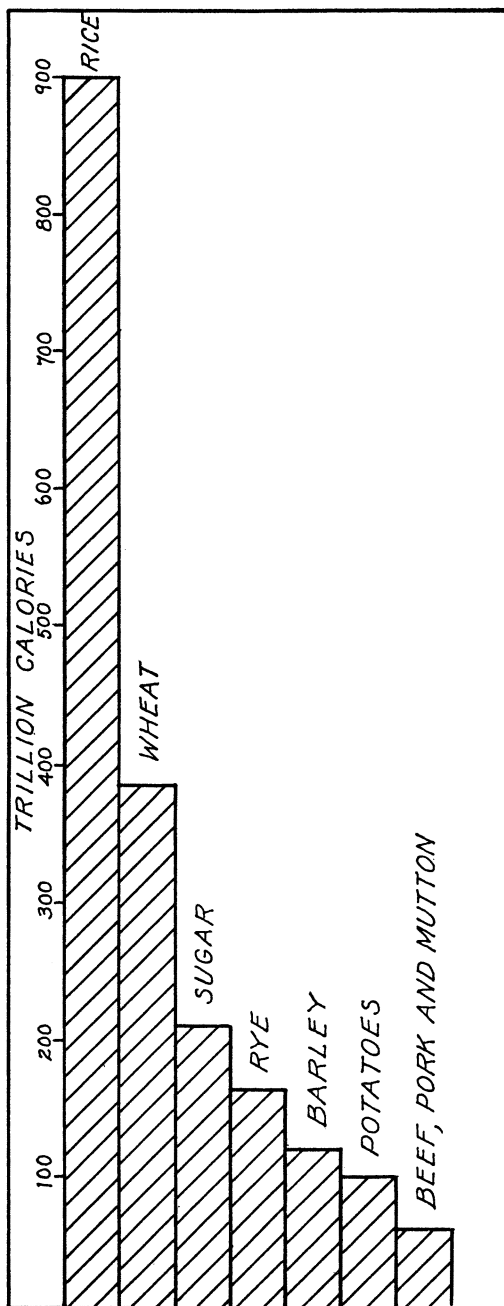


FIG. 1. TOTAL FOOD VALUE OF THE CHIEF WORLD FOODS EXPRESSED IN CALORIES.

RICE, WHEAT AND SUGAR ARE PRACTICALLY ALL CONSUMED AS HUMAN FOOD. SOME OF THE RYE AND BARLEY IS DISTILLED OR USED FOR MALT AND USED FOR ANIMAL FOOD. A CONSIDERABLE PART OF THE POTATO CROP IS USED FOR INDUSTRIAL PURPOSES.—DATA FROM G. K. HOLMES *The Meat Situation in the United States*.

TABLE I

VALUE OF IMPORTS AND EXPORTS OF FOODSTUFFS AND ESTIMATED VALUE OF PRODUCTION FOR VARIOUS COUNTRIES ²

Figures are in millions of dollars

<i>Country</i>	<i>Imports</i>	<i>Exports</i>	<i>Production</i>	<i>Per cent production to requirements</i>
United Kingdom	1,239	200	1,162	53
Belgium	247	79	225	57
Germany	698	282	2,932	88
France	232	109	1,777	93
Austria-Hungary	144	115	1,814	98
United States	562	540	5,334	100
Russia	102	452	3,986	110
Canada	72	204	710	123
Argentina	17	169	469	148

exception, however, of a few localities, animal foods are of very much less importance than vegetables.

The bulk of the world's food supply is produced in the countries in which it is consumed. Large as is the international trade in food products, it represents but a small proportion of the food grown and consumed at home. The United Kingdom and Belgium, which are usually mentioned as the countries dependent for food upon the outside world, are exceptions to the rule. Even these countries produced in the pre-war period 53 per cent and 57 per cent respectively of their own requirements.³ Germany, according to the same estimates, supplied 88 per cent of her requirements, and France 93 per cent. Sparsely populated Argentina, which we think of as primarily a food exporting nation, actually consumes nearly twice as much as she exports. The United States produces more than ten times the value of her exports and, most surprising of all, food importations into the United States, measured in dollars, are slightly greater than food exportations. In other words, the United States is scarcely able to pay for imported foods with what is exported. When we balance accounts we find our soils are supporting only our own population. Russia, which

²Data from N. C. Murray and F. Andrews: *Food Production and Requirements of Various Countries*. Farmers' Bulletin, No. 641, U. S. Dept. of Agriculture.

³*Ibid.*

we think of as a great food surplus country, has a paltry 10 per cent surplus left for exportation after her own requirements are satisfied. As far as the staple foods that satisfy the hunger of mankind are concerned, the world's table is set with products grown near at home.

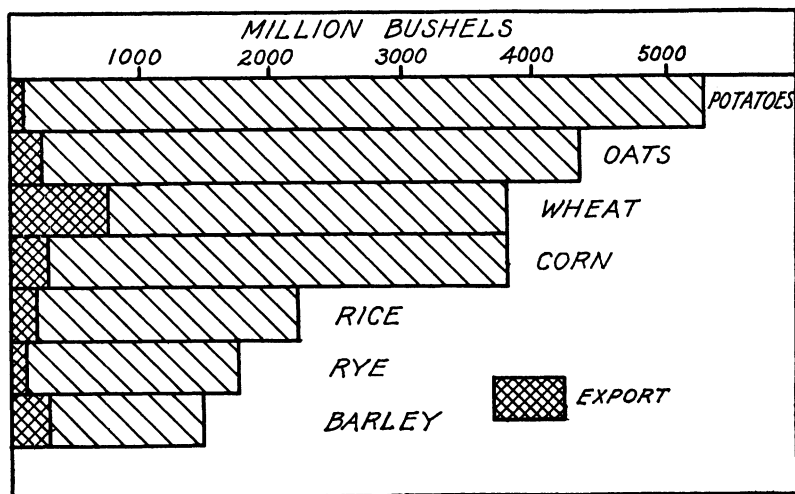


FIG. 2. WORLD PRODUCTION OF GRAINS AND POTATOES IN BUSHELS 1911-13 AVERAGE.

THE HEAVIER SHADED AREA INDICATES THE PART OF PRODUCTION THAT ENTERS INTERNATIONAL TRADE. CHINA IS NOT INCLUDED.

Although the grains are by far the most important foods that enter world trade, only a small proportion of the crops produced goes beyond the borders of the countries in which they were grown. Figure 2 shows that wheat and barley only have any considerable percentage of export as compared with total production, amounting to about 20 per cent in each case. The proportions of vegetables exported are insignificant when compared with production.

SOURCES OF WORLD FOOD

The principal food producing countries, as well as the consuming countries, are in the temperate zones. The tropics, containing one-third of the land area of the globe, are barely able to support one-third of the world population. The north temperate zone, comprising nearly one-half of the land area, contains almost two-thirds

of the population. If we except coffee, cacao, and about one-half of the world's tea—luxuries rather than foods—only two crops of large importance for the outside world are supplied by the tropics: rice and sugar. In the case of rice, some of the largest producing countries, China, Japan, Italy and the United States, are in the temperate zone and the cane sugar of the tropics makes up only a little over half of the total sugar production. Tropic fruits, especially the banana, are important food exports in a few favored localities. But aside from these three crops, the tropics are not producing any important food surpluses for a hungry world. The wonderful food producing ability of the tropics is potential, not developed. They may be the producers of the food surplus of the future, but they are not important sources today.

Many tropical countries are not feeding themselves, but are dependent upon the temperate zone. Brazil, for example, is a large importer of wheat; Cuba is one of the largest meat importing countries. Even rice in large quantities is imported for consumption into Java, the Philippines, the Straits Settlements and the American tropics. India is one of the largest sugar importing countries. The only sections of the tropics that today are at all important in supplying food products are: (1) Indo-China, Siam and Burma, which are all exporters of rice. Most of this crop goes to other tropical countries, however, and in these days of few ships the great distance of these lands from Europe and America is a serious handicap to fully utilizing these supplies; (2) Java, Cuba, Porto Rico and other West Indian Islands, Hawaii and some other tropical lands which supply most of the cane sugar of exports; (3) West Indies and Central America, which send much fruit, especially bananas, to the temperate zones. The shortage of food has stimulated production in the tropics, especially of sugar, to a certain extent, but a rapid extension of agriculture, at all commensurate with the present needs, is impossible. The task is one requiring a period generations long, not years long, and is dependent upon the whole big question of making the tropics habitable and efficient; not one to be solved to meet the emergencies of a world war.

It is in the north temperate zone that we find not only the greatest food needs but also the largest production of today. Measured by production two of the most important agricultural regions of the world are eastern China and Japan, and central and west-

ern Europe. The first of these two regions practically supports its own enormous population; the second region, in spite of its enormous production, needs to import the deficiency in the supplies and this import comes largely from other, but less densely inhabited, sections of the north temperate zone, chiefly the United States, Canada and Russia, and from the sparsely settled lands of the south temperate zone, chiefly Argentine and Australasia. The wheat exporting section of India also lies north of the Tropic of Cancer.

The south temperate zone, containing a land area only one-third larger than the United States and with a total population of but 20,000,000 people, can produce the kind of food demanded by the people of the north temperate zone. Argentina and Uruguay, Australasia and South Africa are suited by climate and soil to produce grains and animals, and with a small population to consume them, they are food exporting nations. In addition to the small land area of the south temperate zone there are several serious handicaps to large food production in this zone: (1) much of the already restricted area is desert; (2) the climate of the more arable areas is a most undependable one, shortages, or even complete failures, of crops in Argentina and Australia being very frequent; (3) they are far from the markets and the bulky grains and meats require a tonnage that the world in this time of war can scarcely spare to bring them to the shores of Europe. The undependableness of Argentina's climate is indicated most forcefully by the great draught of last year, which, in the world's supreme hour of need, made that country almost worthless as a supplier of wheat and corn. Even to a greater degree does Australia's production of grain vary through wide margins with its exceedingly capricious rainfall.

THE WORLD'S GRAIN SUPPLY

Wheat. Wheat and rice are rivals as sources of human food. Rice, however, while it feeds many millions of people, is consumed almost entirely where it is produced. Wheat is the great staple food export. Corn, which equals wheat in production, is largely used for animal food and enters world commerce only to a slight extent. Of the world production of 3,823 million bushels of wheat (not including China), considerably over half is grown in Europe. Russia in the three years' average preceding the war led the world

in production, and although that country consumed five-sixths of what was produced, enough was left for export to make Russia the leading source of supply for western Europe. Roumania, also, although producing but 88,000,000 bushels, had an export surplus of 54,000,000 bushels, nearly half of Russia's export. Bulgaria had a 12,000,000 bushel surplus for export. Germany, although an exporter of wheat, imported three times her export and therefore cannot be regarded as a wheat surplus country. The large production of wheat in Austria-Hungary was practically all consumed at home. Of the other European countries, France, Italy, Germany, Spain and the United Kingdom are all large producers, but production is less than needs. Holland, Belgium, Switzerland and the Scandinavian countries largely depend upon importations for wheat. Four countries, United Kingdom, Germany, Italy and France, took 60 per cent of the world's imported wheat, the United Kingdom alone importing 221,000,000 bushels on the average each year, or 30 per cent of the total world importation. Brazil, with a wheat importation of 23,000,000 bushels, is the only country outside of Europe with any considerable wheat import. The supply of wheat for the importations into Europe, aside from what comes from Russia and Roumania, is supplied principally by the United States, Canada, Argentina, India and Australia. These seven countries furnish 94 per cent of the world export of wheat.

Such were the conditions before the war. What is the state of the world wheat this year?

Russian wheat is shut off from the outside world by the closing of the Bosphorus, and hence the surplus this country contributed to the world is not available. The wheat of the Balkans and of Turkey, as well as of most of Roumania, is to be added to the supplies of the Central Powers. There is no means of knowing the actual conditions of the wheat crop of Germany and Austria-Hungary this year. The average production (1911-1913), export and import of the countries now occupied by the Central Powers, in millions of bushels are shown in Table II. By including Roumania, Poland and Belgium we see that before the war the lands now in control of the Central Powers had a wheat deficit of 54,000,000 bushels. If we include Turkey—both Asiatic and European—with the other Balkan States, we would add to production about 55,000,000 bushels. Considerable of this was available for

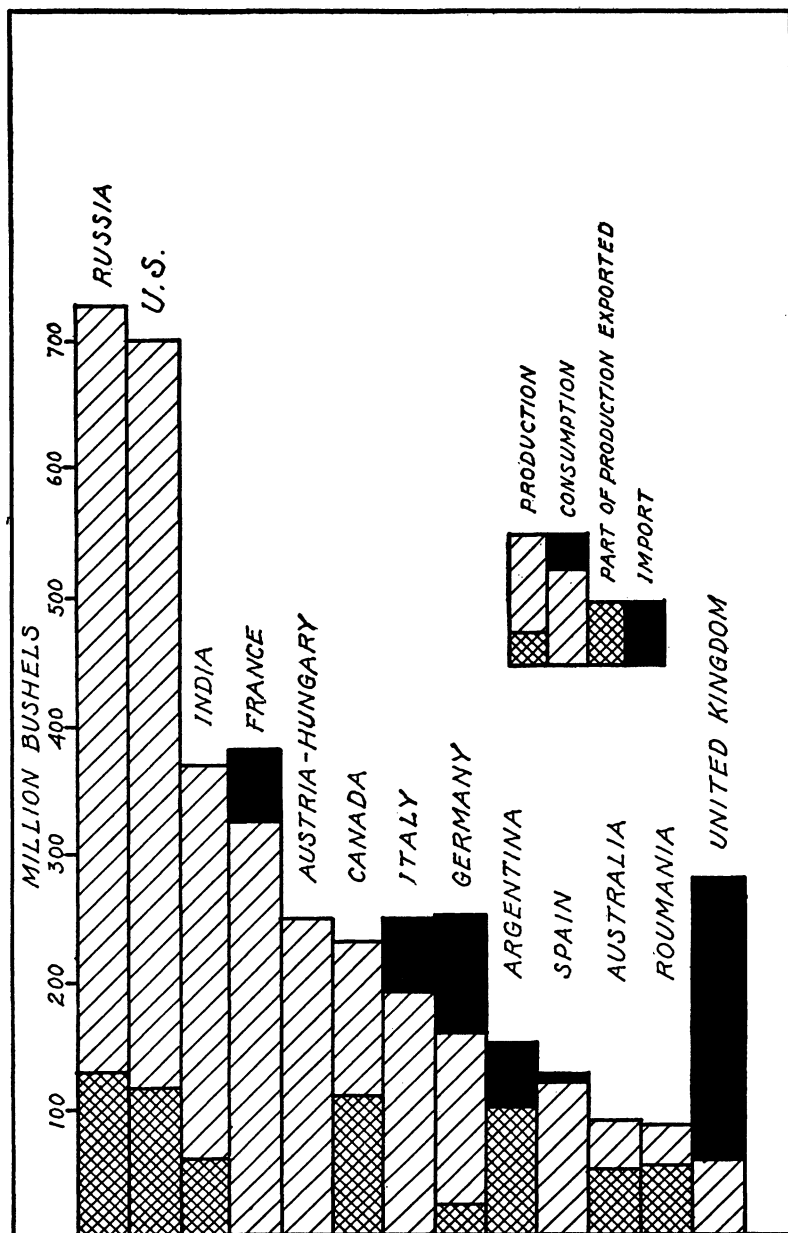


FIG. 3. WHEAT PRODUCTION, EXPORT AND IMPORT OF THE LEADING PRODUCING COUNTRIES, 1911-13 AVERAGE. THE TWO LIGHTER SHADINGS COMBINED SHOW PRODUCTION OF WHICH THERE WAS EXPORTED THE AMOUNT INDICATED BY THE CROSS LINES. THE SOLID BLACK INDICATES IMPORTATIONS. HENCE THE COMBINED LIGHT AND BLACK AREAS SHOW WHEAT CONSUMPTION.

TABLE II
WHEAT PRODUCTION, EXPORT AND IMPORT OF LEADING COUNTRIES⁴
1911-1913 averages

<i>Countries in Control of Central Powers</i>	<i>Production</i>	<i>Export</i>	<i>Import</i>
Germany	160	23	91
Austria Hungary	247	1	..
Bulgaria	46	12	..
Roumania	88	54	..
Belgium	15	21	74
Poland (1912-1914)	18	..	..
Total—Central Powers	574	111	165
<i>Neutral European Countries</i>			
Holland	5	54	78
Sweden	8	..	7
Norway	.3	..	5
Switzerland	3	..	20
Spain	123	..	4
Denmark (1913 only)	4	..	7
Total—Neutrals	143.3	54	121
<i>Western Allies</i>			
United Kingdom	61	..	221
France	324	..	55
Italy	191	..	59
Portugal	8	..	2
Greece	7	..	7
Total—Allies	591	..	344
<i>Other Countries</i>			
Russia	727	128	..
United States	705	116	..
India	370	60	..
Canada	229	111	..
Argentina	156	101	..
Australia	89	52	..
Algeria	33	5.5	..
Tunis	6	1	..
British South Africa	6	..	6
Egypt	33	..	..
Brazil	..	..	23
Japan	26	..	3
Total—World	3,823	767	723

⁴In millions of bushels. Flour is reduced to wheat equivalent. The blank spaces indicate no import or export, or only small amounts. Data for this, and the other tables, have been taken from the Year Books of the United States Department of Agriculture and from Statistical Notes on Production, etc., of Cereals, published by the International Institute of Agriculture, Rome.

export, and possibly would be capable of materially reducing the Central Powers' deficit at the present time. The neutral nations bordering the Central Powers are all wheat importing nations, and presumably can be of little or no aid in supplying this grain. But unless the Central Powers have been able materially to increase wheat production in the face of increased consumption in the army, lack of skilled man power for the farms, shortage of fertilizer and actual destruction by the acts of war, the supply must be short of actual demands.

With the exception of Spain, the neutral countries, largely for climatic reasons, are small producers and therefore largely depend on importations. Neutral imports exceeded neutral exports by 67,000,000 bushels in the average for the period 1911-1913.

The western allies were, in spite of large wheat production, the chief importers. With a total production of 591,000,000 bushels, there is practically no export, and 344,000,000 bushels of import to supply the needs. The wheat importations necessary therefore to supply the deficit of the European countries, excluding Russia, before the war, were 465,000,000 bushels of which the neutral nations and the western allies required 411,000,000 bushels. How can this shortage for the neutral nations and the allies be met?

The wheat production of the western allies will this year fall far below the normal pre-war production. France, whose average production in 1911-1913 was 324,000,000 bushels will produce this year but one-half this crop—162,000,000 bushels.⁵ On the basis of pre-war conditions France would require therefore an importation of 182,000,000 bushels. The wheat crop of Italy is below the pre-war average, and it is estimated that Italy's deficit will amount to 73,000,000 as compared to 59,000,000 bushels for 1911-1913. The wheat crop in the United Kingdom is reported in excellent condition, but an importation of over 200,000,000 bushels may be required to fully meet the needs. This gives a total deficiency of over 457,000,000 bushels of wheat for the three western allies. To this must be added the needs of Greece and Portugal (9,000,000 bushels before the war) and the neutral countries which, as we have seen, in the pre-war period amounted to 67,000,000 bushels.

Can the wheat exporting nations meet this western European

⁵ Estimate of International Institute of Agriculture as given in monthly Crop Report, United States Department of Agriculture, August, 1915.

deficiency of over 524,000,000 bushels? Of the five countries that usually have a large available surplus of wheat—United States, Canada, Argentina, India and Australia—one, Argentina, has practically no surplus, the 1916–1917 crop being practically a failure. Canada will probably have a surplus of 120,000,000 bushels, and Australia 50,000,000. This gives a total of 328,000,000 bushels. To this may be added several million bushels of surplus from North Africa (Algeria and Tunis). But on the other hand South Africa, Brazil and Japan are in normal years additional wheat importing countries. It would seem, therefore, that the 1917 wheat supply would fall at least 200,000,000 bushels short of the normal demand, and will probably be over 300,000,000 bushels.

Corn. Corn rivals wheat in quantity produced, but its importance as a food supply is very much less. This is due to the fact that the merits of corn as a human food are not fully appreciated by a large proportion of the human race, its cultivation is less capable of extension due to climatic limitations, and much of the crop is used for feeding animals. In the years 1911–1913, the United States produced 2,700,000,000 bushels of corn, against 3,800,000,000 bushels for the world production. This was over 71 per cent of the world crop. Most of this great yield was consumed at home by cattle and swine, only 48,000,000 bushels ($1\frac{1}{2}$ per cent) being exported. Argentina, the second country in production, produced in the same period 252,000,000 bushels, of which half (128,000,000 bushels) was exported. The only other countries in which corn production exceeded 100,000,000 bushels were Austria-Hungary, Roumania and Italy. India, Russia, Egypt, South Africa and Bulgaria are lesser producers. Since the United States crop for 1917 promises to surpass all previous records, the estimate being 3,248,000,000 bushels, an increase of 700,000,000 bushels over the 1916 crop, the almost total failure of the Argentine crop is more than compensated. Since the corn crop of Italy also promises well for this season, the surplus corn may help in the conservation of our wheat. The corn crop of the United States for this year will be greater than the total world production previous to 1905.

Rye and Barley. As a source of food in many countries of Europe, notably Russia and Germany, rye is a more important food supply than wheat. Barley is also of very great importance, although a considerable part of this crop has been used in the manu-

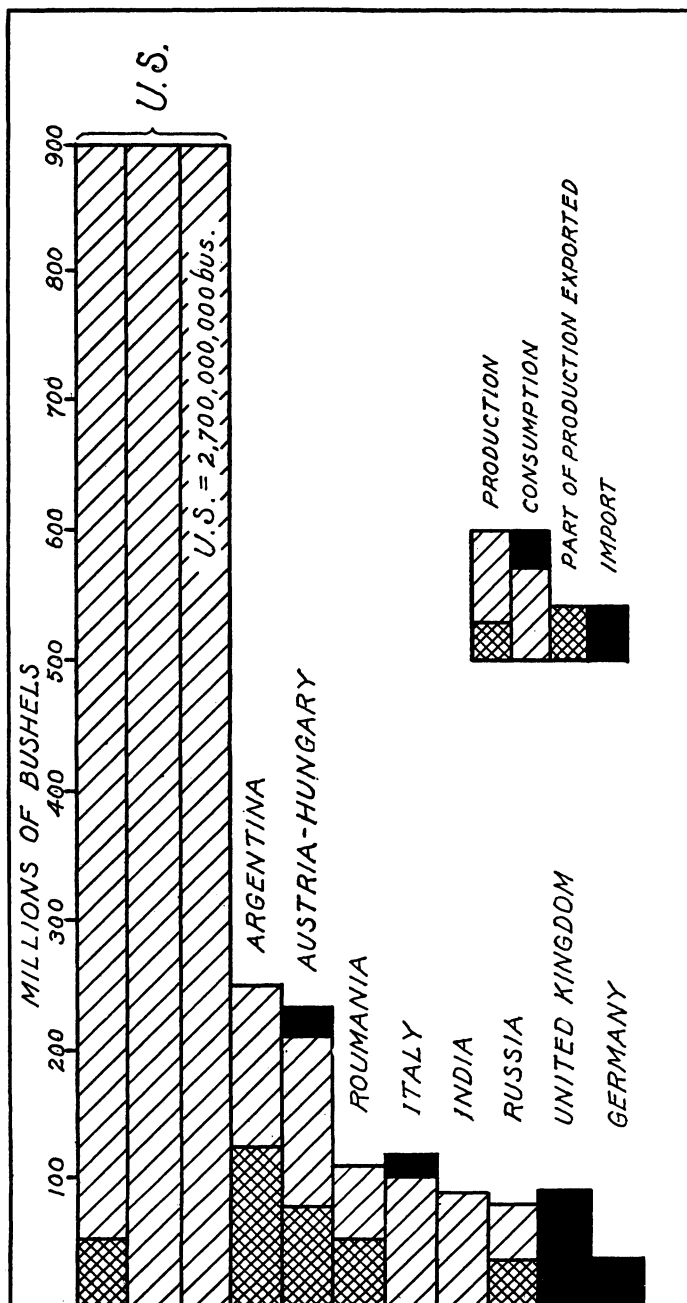


FIG. 4. LEADING COUNTRIES IN PRODUCTION, EXPORT AND IMPORT OF CORN, 1911-13, IN ORDER OF PRODUCTION.

facture of malt. Over one-half of the world's rye and one-third of the world's barley are grown in Russia. Of the 1,783,000,000 bushels of rye produced in 1911-1913, the countries now occupied by the Central Powers produced 655,000,000 bushels, about 37 per cent of world production. These countries had a slight surplus for export, about 29,000,000 bushels above imports. For barley, the Central Powers were much more dependent upon the outside world. They imported, in addition to a production of 353,000,000 bushels, equivalent to one-fourth of the world production, 175,000,000 bushels, against an export of 41,000,000 bushels. Germany especially was a heavy importer of barley.

TABLE III
PRODUCTION, IMPORT AND EXPORT OF RYE
Millions of bushels. 1911-1913 averages

<i>Central Powers</i>	<i>Production</i>	<i>Export</i>	<i>Import</i>
Germany	455	45	16
Austria-Hungary	163	1	1.5
Bulgaria	10	2.3	..
Roumania	4	3	..
Belgium	23	1	6
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Total—Central Powers	655	52.3	23.5
<i>Neutral Countries</i>			
Spain	25
Sweden	23	..	4
Denmark	18	..	8
Holland	16	19	31
Norway	1	..	10
Switzerland	1.7	..	.7
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Total—Neutrals	84.7	19	53.7
<i>Western Allies</i>			
United Kingdom	1.6	..	2
France	48	..	3
Italy	5	..	.6
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Total—Allies	54.6	..	5.6
<i>Other Countries</i>			
Russia	935	35	5
United States	37	1	..
Canada	2.4
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Total—World	1,783	107	107

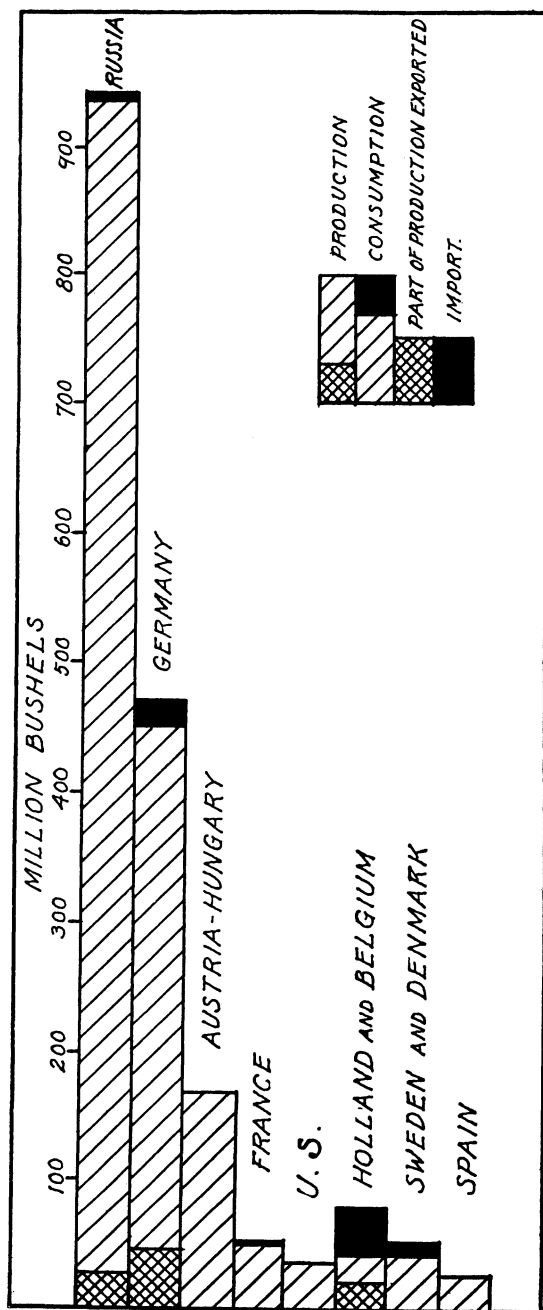


FIG. 5. PRODUCTION, EXPORT AND IMPORT OF RYE IN LEADING PRODUCING COUNTRIES, 1911-13.

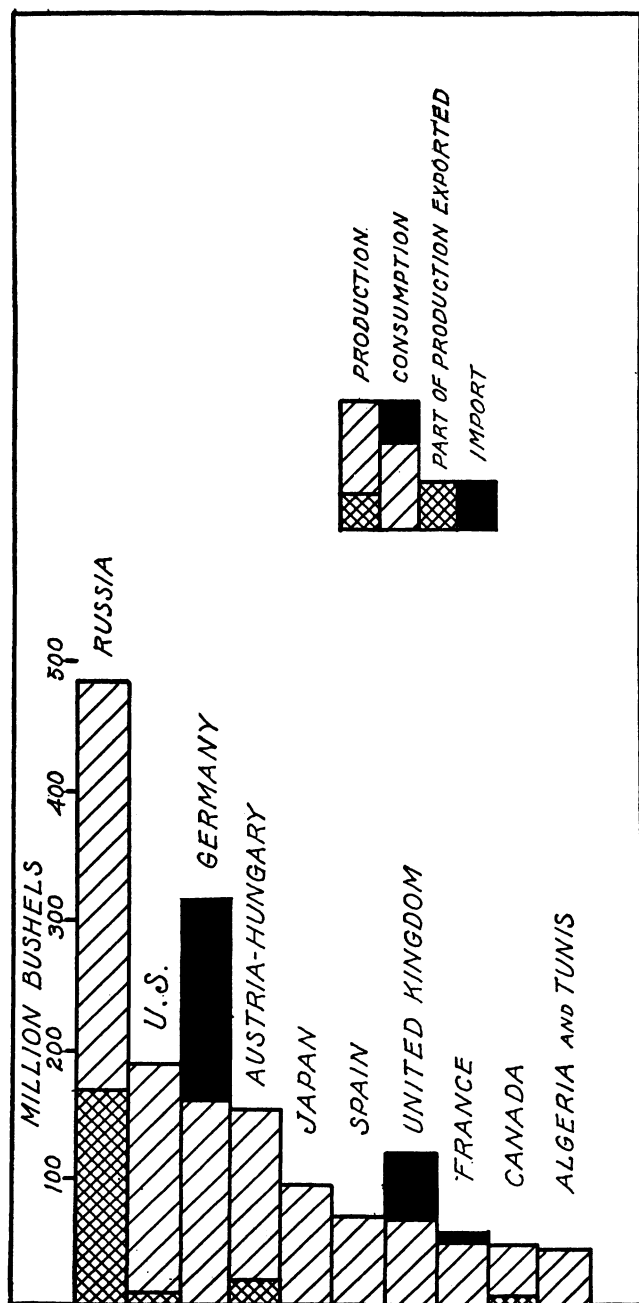


FIG. 6. PRODUCTION, EXPORT AND IMPORT OF BARLEY IN THE TEN LEADING COUNTRIES IN PRODUCTION, 1911-13.

The neutral countries of Europe produced rye and barley in important quantities, this crop being suited to their severe climate and soil conditions. To meet their consumption needs, however, a net import of 34,000,000 bushels of rye was required and 18,000,000 bushels of barley.

TABLE IV
PRODUCTION, IMPORT AND EXPORT OF BARLEY

Millions of bushels. 1911-1913 averages			
<i>Central Powers</i>	<i>Production</i>	<i>Export</i>	<i>Import</i>
Germany	158	1.2 (malt)	154
Austria-Hungary	153	18	.8
Bulgaria	11	1	..
Roumania	25	17	..
Belgium	4	4	20
Total—Central Powers	353	41.2	174.8
<i>Neutral Countries</i>			
Spain	67	..	..
Sweden	14	..	..
Denmark	23	3.5	2.1
Norway	3	..	4
Holland	3	30	41
Switzerland	.5	..	4.5
Total—Neutrals	110.5	33.5	51.6
<i>Western Allies</i>			
United Kingdom	62.5	1	52
France	48	.5	7
Italy	10	..	.8
Total—Allies	120.5	1.5	59.8
<i>Other Countries</i>			
Russia	485	168	..
United States	187	8	..
Algeria and Tunis	45	8	..
India	38	17	..
Argentina	5	1	(malt) 1.3
Canada	47	7	..
Japan	93	..	..
Total—World	1,489	294	290

Among the western allies, rye was of little importance as a food product, except in France, whose production of 48,000,000 bushels supplied her needs within 3,000,000 bushels. Very little rye was imported into England and Italy. Barley, on the other hand, was of considerable importance. The United Kingdom grew more barley than wheat and imported in addition 52,000,000 bushels. The net imports of barley into the United Kingdom, France and Italy amounted to 58,000,000 bushels. The neutral countries of Europe and the western allies, therefore, before the war required in addition to their production of rye and barley an importation of 116,000,000 bushels of these two grains. The supply of the 40,000,000 bushels of rye in this deficit was obtained largely from Russia and Germany—sources that are not now available. The 76,000,000 bushels of barley imports had a wider source. In addition to Russia and Roumania, which supplied 60 per cent of the barley exports before the war, barley exports from India, Algeria and Tunis, the United States and Canada, were of some importance. With the restrictions of the use of barley and rye for liquors, and the increased use of flour from these grains for bread, the barley and rye crops have assumed an increased importance as a food during the war.

The estimates of rye and barley crops for 1917 in Europe are favorable. The United States estimates⁶ place barley production 17,000,000 bushels above the 1911–1913 average, while an estimated rye production of 56,000,000 bushels makes the production of this grain 19,000,000 bushels above the average. Nevertheless, the shutting off of Russian and central European rye and barley from the neutral and western allies adds a very serious burden to the problem of supplying Europe with grain this year. Based upon the consumption of grains before the war, the neutral nations and western allies face a shortage of at least 640,000,000 bushels of wheat, rye and barley. If we should add to this the needs in corn, oats and other grains, the cereal deficiency will mount up into figures well over 1,000,000,000 bushels. The staggering burden of meeting this deficiency is placed upon the cereal surplus countries of the Americas, Asia and Australia.

Rice. Estimates of the world production of rice are less reliable than for the other grain crops for the reason that China, probably the largest producer, furnishes no data for any accurate esti-

⁶ Monthly Crop Report, September, 1917.

mate. The estimate of 2,200,000,000 bushels of cleaned rice for 1910 for all countries except China, is based upon the data given in recent Year Books of the Department of Agriculture and Statistical Notes of the International Institute of Agriculture.⁷ The production of three of the eighteen provinces of China is given in 1910 at nearly 800,000,000 bushels.⁸ The importance of rice as a food is even greater than its quantity of production would indicate. Judged by food value, rice far exceeds its nearest competitor. A sixty pound bushel of wheat has three-fourths of the food value of a sixty pound bushel of cleaned rice. Even more than wheat, rice is consumed in the countries where it is grown. As shown in Table V, of the 200,000,000 bushels that enter international trade, the largest proportion is a transference of rice from one tropic country to another or to the rice producing countries of China and Japan.

TABLE V
RICE PRODUCTION, EXPORT AND IMPORT
Millions of bushels. 1911-1913 averages

	<i>Production</i>	<i>Export</i>	<i>Import</i>
World	2,200 (excluding China)	210	191
India and Ceylon	1,091.7	100	19
Japan (Empire)	341	....	20
Java	133	2.2	18.5
French Indo-China	83.3	32	....
Siam	54	30	....
Philippines	19	....	7
United States	12	....	4
Italy	11	....	....
China	(no data)	....	10
Singapore and Straits	(no data)	18	36
Russia	6	....	4.5
Germany	....	6.6	17.5
Holland	....	8.5	14
United Kingdom	....	....	12
Belgium	....	1.6	3
France	....	1	8.1
Egypt	8.3	....	2
Cuba	....	....	4.6

⁷ Statistical Notes on the Production, Imports and Exports, Prices and Maritime Freights of Cereals. Rome: International Institute of Agriculture. Published twice yearly.

⁸ Year Book, Dept. of Agriculture, 1916, p. 608.

Only a small proportion of the rice surplus normally goes to European countries—not much over one-third.

Of the western countries Italy and the United States are the only countries in which the growing of rice has become an important industry. From 1911–1913 the average production in the United States was 12,000,000 bushels of cleaned rice, as compared to 11,000,000 bushels for Italy. The possibilities of future extension in the United States of this, the most important of all food crops, are almost unlimited. Since its production requires much outlay of time and capital in equipping for irrigation, it cannot be depended upon to a large extent as an emergency crop for meeting shortages in other grains during the war. The 1917 estimate of rice production in the United States, however, is given at 32,200,000 bushels.⁹

Beans. A food crop of great importance in the far east, beans are of relatively small importance in the west, when compared with the grains. Of the countries for which we have statistics, India, with 125,000,000 bushels, is the most important; Italy, with 23,000,000 bushels; Japan, with 21,000,000 bushels; Austria-Hungary, with 19,000,000 bushels; Russia, with 12,000,000; Spain and the United States, each with 11,500,000 were the most important producers before the war. The introduction of the soy bean from China and Japan into the western world met the need of a seed-crop of large yielding possibilities. Since the soy bean, because of its large content of oil and proteids, can be a substitute for meat, this crop is becoming an increasingly important one. The production of beans this year in the United States and especially of the soy bean in the southern states, will be far in excess of any previous year, and should be an important addition to our food supply.

Potatoes. The potato crop of the world, measured by its bulk, is one of the most important of our food crops. Nearly 68 per cent of this enormous crop is produced in Germany, Russia and Austria-Hungary. Very little, however, enters international trade. The crop is consumed at home. Only 75,000,000 bushels out of the 5,313,000,000 total entered foreign trade and this for the most part was across the frontiers of Germany. A very large part of the potato crop is used for industrial purposes. This, combined with the low food value of a bushel of potatoes as compared to a bushel of grain, puts the food value of the potato crop lower than

⁹ Monthly Crop Report, September, 1917.

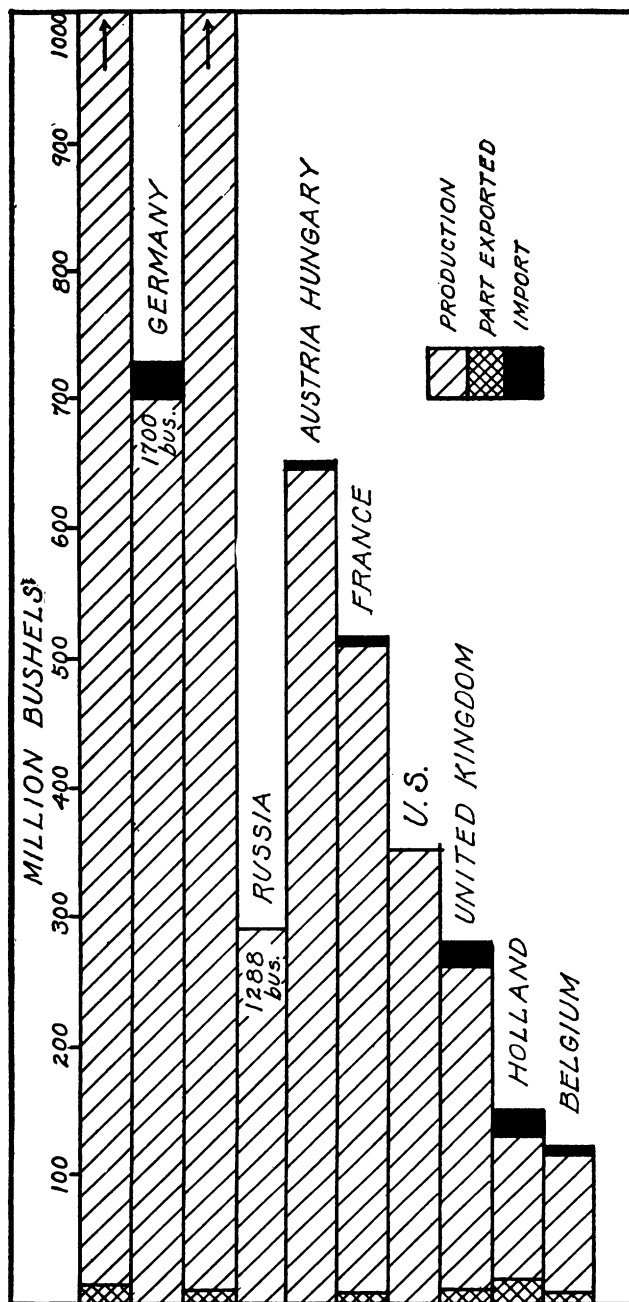


FIG. 7. PRODUCTION, EXPORT AND IMPORT OF POTATOES IN EIGHT LEADING COUNTRIES, 1911-13 AVERAGE.

any of the grains or sugar as far as its total value to the world is concerned. Its importance to the potato-growing nations of Europe, however, should not be underestimated. Germany, the largest producer before the war, was also the largest importer. The net import into Germany—17,000,000 bushels—was over three times as large as the net imports of Great Britain—5,100,000 bushels. Before the war the western allies, with the exception of the United Kingdom, and the neutral countries except Switzerland, were either exporting potatoes or fully meeting their own needs. The 1917 prospects

TABLE VI
PRODUCTION, EXPORT AND IMPORT OF POTATOES

	Millions of bushels. 1911-1913 averages		
<i>Central Powers</i>	<i>Production</i>	<i>Export</i>	<i>Import</i>
Germany	1,699	12	29
Austria-Hungary	642	1.3	4
Roumania	3	....	....
Belgium	113	9	6
Total—Central Powers	2,457	22.3	39
<i>Neutrals</i>			
Holland	128	16	2
Sweden	66	....	....
Denmark	36	1	....
Norway	27	....	....
Switzerland	42	....	3.2
Spain	92	1.8	....
Total—Neutrals	391	18.8	5.2
<i>Western Allies</i>			
France	507	8	7
United Kingdom	260	6.2	11.3
Italy	61	4	....
Total—Allies	828	18.2	18.3
<i>Other Countries</i>			
Russia	1,288	8	....
United States	348	1.8	....
Argentina	38	....	1.3
Canada	78	1.4	....
Total—World	5,313	75	77

indicate a surplus production of potatoes in Italy,¹⁰ and good crops in France and Great Britain. In the United States, the potato crop this year is given as 100,000,000 bushels above the pre-war average, and 175,000,000 above last year's crop.¹¹ The supply of this staple vegetable should be more than sufficient to meet the normal demand, and help relieve the great shortage in grains.

Sugar. In the year preceding the war, 1913, the world sugar crop was given at 20,883,000 tons. The wheat crop was 114,000,000 tons. This makes sugar one of the bulky food products and because of the high food value of sugar it stands next to rice and wheat as a world food. Of the 20,883,000 tons of sugar, 11,118,000 were cane sugar, the balance beet sugar. With the exception of the 733,000 tons of beet sugar produced in the United States, practically the entire beet sugar supply was grown in Central Europe. Germany, Russia and Austria-Hungary alone produced 67.4 per cent of the total beet sugar and 32.4 per cent of the total sugar supply. Germany and Austria-Hungary, and, to a lesser extent, Russia, were enormous exporters. In fact, every country of Europe, with the exception of Great Britain, Italy, Switzerland and Norway, and some of the Balkan States, was either meeting all its own sugar needs or producing for export. The United Kingdom, however, was not producing any sugar, and was, next to the United States, the largest importer of sugar in the world. Of the 2,000,000 tons of sugar imported into the United Kingdom, about one-third came from Germany and Austria-Hungary. Belgium, Holland and France were also exporting sugar to England.

The outbreak of the war made necessary a radical change in Europe's sugar supply. The big export market for German and Austrian sugar being shut off, sugar-beet production in these countries gave place to other crops. The Belgium beet sugar and much of the sugar-beet area of France came under Germany's control, so that even France was deprived of her own sugar supplies. The neutral importers, Norway and Switzerland, have remained in touch with the Central European sugar countries, but the western nations have been compelled to go to the tropics. This has given a great impetus to cane sugar growing.

In Russia there has been a great decline in beet sugar produc-

¹⁰ Commerce Reports, August 11, 1917, p. 547.

¹¹ Monthly Crop Report, September, 1917.

tion with the progress of the war. So great has been the decline that, according to the *International Sugar Journal*,¹² Russia this year will not produce enough to supply her needs.

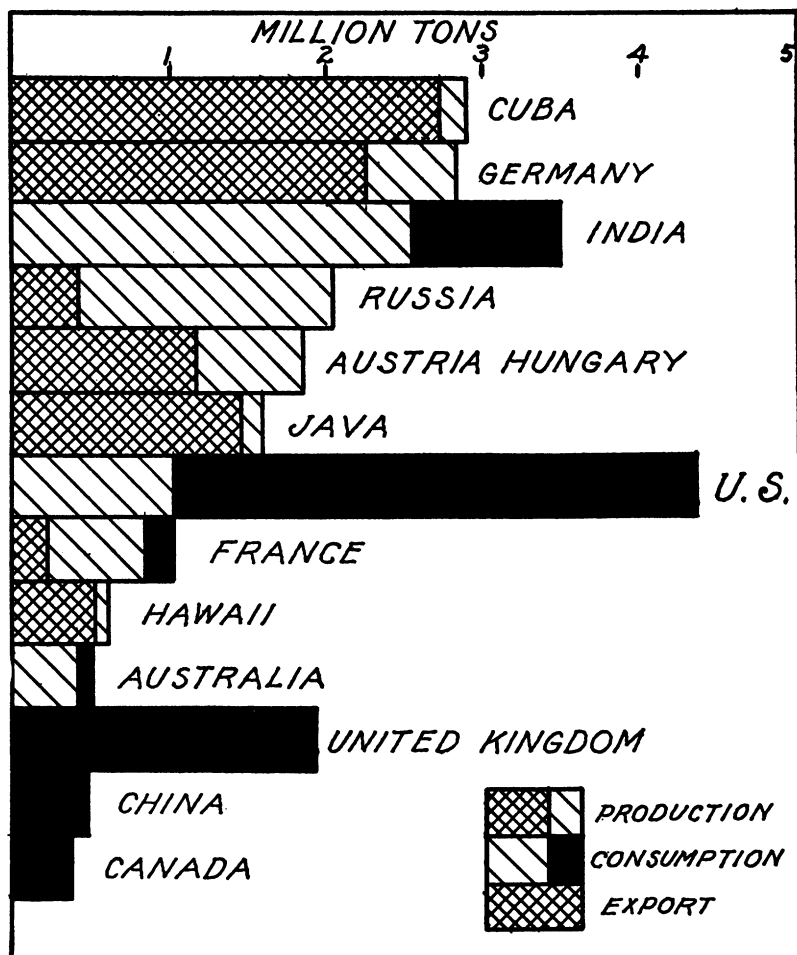


FIG. 8. PRODUCTION, EXPORT AND IMPORT OF SUGAR IN THE TEN LEADING SUGAR PRODUCING COUNTRIES, AND THE IMPORTS OF THE UNITED KINGDOM, CHINA AND CANADA. ARRANGED IN ORDER OF PRODUCTION, 1913.

A large percentage of the cane sugar of the world has been produced in Cuba, India, Java and Hawaii. Of these countries, India

¹² XXX, pp. 304, 305, July, 1917.

TABLE VII
PRODUCTION, EXPORT AND IMPORT OF SUGAR, 1913

Short tons			
<i>Cane Sugar</i>	<i>Production</i>	<i>Export</i>	<i>Import</i>
Cuba	2,909,000	2,738,000	.....
India	2,534,000	.....	961,000
Java	1,591,000	1,471,000	.....
Hawaii	612,000	543,000	.....
Porto Rico	398,000	382,000	.....
Australia	397,000	.....	88,000
South America	874,000	250,000	206,000
Mauritius	271,000	227,000	.....
United States	300,000	.....	3,306,000
	<hr/>	<hr/>	<hr/>
Total Cane	11,118,000		
<i>Beet Sugar</i>			
United States	733,000	.....	.....
Germany	2,886,000	2,231,000	.....
Russia	2,031,000	415,000 (1912)	.....
Austria-Hungary	1,858,000	1,184,000	.....
France	861,000	221,000	123,000
Italy	337,000	.....	15,000
Holland	253,000	220,000	123,000
Belgium	249,000	125,000	.....
Spain	187,000	.....	.....
Denmark	158,000	.....	.....
Sweden	151,000	.....	.....
Switzerland	5,000	.....	129,000
United Kingdom	....	.....	1,936,000
China	(?)	.....	474,000
Canada	....	.....	335,000
	<hr/>	<hr/>	<hr/>
Total Sugar	20,883,000	9,707,000	8,925,000

consumed all her enormous production and imported 961,000 tons in addition. The other tropic countries mentioned, together with the other West Indian Islands, Brazil and Peru, produce for export. The war has greatly stimulated the sugar industry of the tropics, especially of the West Indies, South America, Formosa and Java, reviving the ancient industry. The 1916-1917 crops of cane sugar will surpass all previous records. England and France are now receiving their sugar import from the East and West Indies, Mauritius and indirectly the United States. The establishment of new

sugar plantations, with the installation of necessary machinery for crushing and preparing the raw sugar for market, is not a rapid process and the extension of the sugar cane production cannot rapidly meet the deficit caused by the upheaval of the sugar industry in Europe.

Meats and Other Animal Foods. The animal foods consist of meats (principally beef, pork and mutton, with a relatively very small amount of goat, horse, dogmeat and poultry), milk, butter and cheese, and fish. Compared with grains and vegetables, meats are of much less importance as a world food supply than we of the western world are accustomed to thinking. Figure 1 shows the combined food value of beef, pork and mutton to be only three-fifths that of potatoes, and scarcely to be compared with rice and wheat. This is another way of saying that meat does not play an important part in the diet of the world. Only a few countries are large meat consumers. These countries are the newly opened countries of large grazing facilities and small population such as Australia, New Zealand, United States, Argentina and Canada, or the countries of large industrial population that can readily import meat. The United Kingdom, Germany, France and Belgium represent such countries. But the per capita consumption is very much less than in the first group. The people of the densely populated countries of the far east and the tropics eat very little meat. No figures are available, but the per capita consumption of China would probably be very much lower than that of the lowest European country shown in the diagram. (Figure 9.)

Not only is meat consumption relatively small in most countries, but the meat that is consumed is produced at home. Only a small part of the production enters international trade. The total tonnage of meats in import trade in 1912 is given at 2,400,000 tons,¹³ 8 per cent of the world's consumption, which is estimated at 25,000,000 tons. The movement of the world wheat crop for the same year was 22,500,000 tons out of a production of 114,000,000 tons. Over 85 per cent of the world exports of meat in 1912 were supplied by five countries, *viz.*, Argentina and Uruguay, 36 per cent; United States, 31.1 per cent; Australia and New Zealand, 18.7. Canada, Denmark and Russia supplied practically all of the remain-

¹³G. K. Holmes, *Meat Situation in the United States, Part I. Report No. 109, U. S. Dept. of Agriculture, Office of the Secretary, p. 15.*

der. The only country in which imports of meat constituted a large proportion of the consumption was the United Kingdom, 40 per cent of this country's meat needs being imported. This was nearly 62 per cent of the total world imports of meats. Germany, Holland, Belgium, France, Russia, Switzerland, Norway, Sweden, Denmark and Spain were all importers of meats, fats and oils. The only country outside of Europe which imports meats in considerable quantity is Cuba. Beginning with 1913, however, a considerable and growing importation of meat into the United States had developed, principally of chilled meat from Argentina and Australasia. This importation in 1914 amounted to 200,000,000 pounds and in 1915 to 223,000,000 pounds, making the United States the fourth country in importance as an importer of meat, as well as the leading exporter.

The effect of the war upon the meat supply is very difficult to measure with any high degree of accuracy. The great demand for food for man, combined with the difficulty of importing animal fodder, or the desire to use the grains for food rather than for fodder, has caused an increased slaughter of animals. According to the United States Food Commission,¹⁴ the number of meat producing animals has decreased since the outbreak of the war by 115,005,000, divided as follows: cattle, 28,080,000; sheep, 54,500,000; hogs, 32,425,000. The greatest reduction was, of course, in the warring nations and some of the nearby neutrals. But the increased slaughter in some of the surplus meat countries seriously depleted the number. For example, the number of sheep in Australia fell from 78,600,000 in 1904 to 72,300,000 in 1916. In France, the decrease is estimated to have been for cattle from 14,800,000 in December, 1913 to 10,845,000 in 1916; for hogs, from 7,047,000 in 1913 to 4,362,000 in 1916.¹⁵ In the Netherlands and Norway there has been a slight increase in the number of animals.

German stocks were seriously reduced in the fall of 1914 and early 1915, but apparently have been gradually increased since.¹⁶ If the accounts that have come to us of the food shortages in Germany are at all correct, one of the most serious deficiencies is in animal fats and foods.

¹⁴ Washington Official Bulletin, August 21, 1917.

¹⁵ Data from Robert W. Woodbury, personal communication.

¹⁶ *Ibid.*

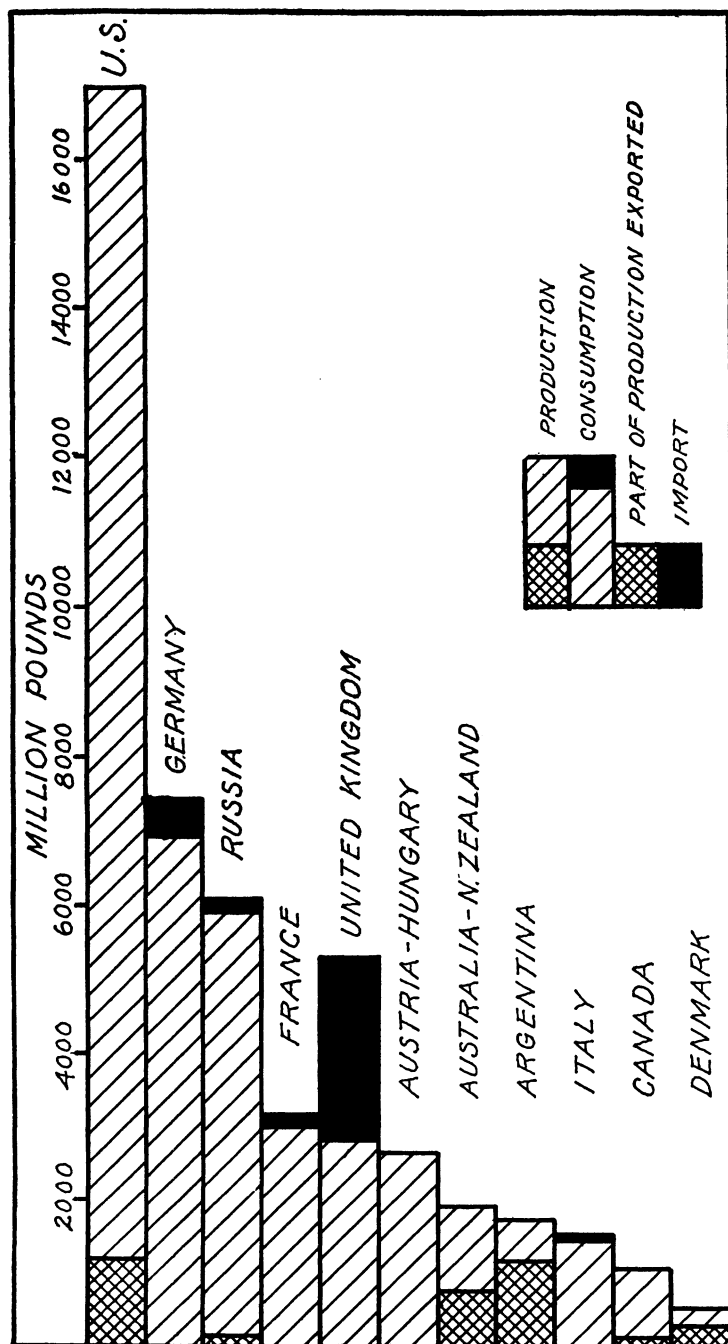


FIG. 10. PRODUCTION, EXPORT AND IMPORT OF MEAT (BEEF, PORK AND MUTTON) IN THE LEADING PRODUCING COUNTRIES. THE CROSS LINES INDICATE THE PART OF PRODUCTION EXPORTED, THE BLACK SHADING THE IMPORTS. DATA FROM G. K. HOLMES, *The Meat Situation in the United States*. REPORT 109, OFFICE OF SECRETARY, U. S. DEPT. OF AGRICULTURE.

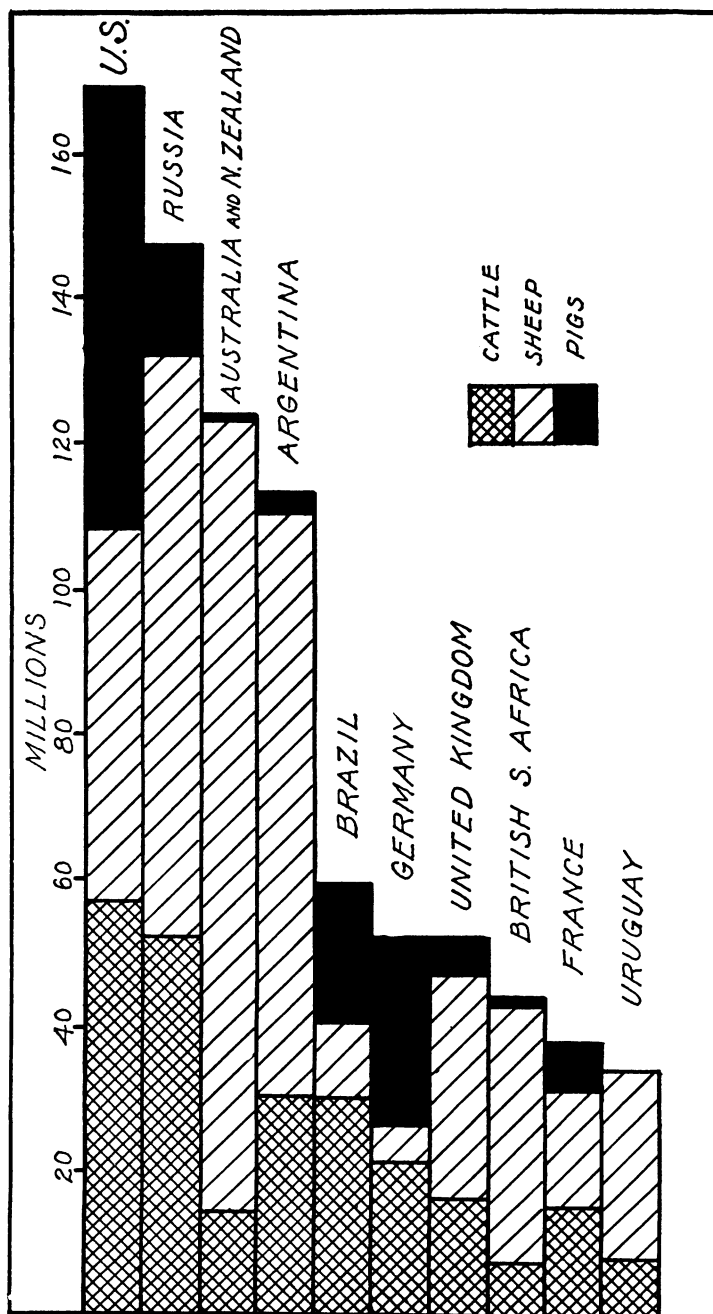


FIG. 11. NUMBER OF MEAT PRODUCING ANIMALS IN TEN LEADING COUNTRIES (CHINA NOT INCLUDED).

To meet the increasing demands of the western allies the United States, Argentina, Australasia and South Africa are being called upon as never before for meat supplies. Our exportations of meat last year, (1916-1917) were well over 2,000,000,000 pounds as compared with 493,848,000 for the three year pre-war average, a gain of over fourfold.

Dairy Products. Other animal products of large importance are butter, cheese and milk. Milk enters into international trade in the form of condensed milk, butter and cheese. Butter and cheese, particularly, being items of small bulk relative to their high food value and their high money value, are of considerable importance. The chief dairying region of the world is northwestern Europe, where climate especially favors the dairy cow. Butter, cheese and milk here are all exceedingly important foods, and in spite of the enormous quantities that are produced for consumption large additional quantities were imported from foreign countries. Tables VIII and IX indicate the chief importing and exporting countries of butter and cheese.

The effect of the war on dairy products has been disastrous. The large killing of milk animals for meat, the shortage of animal fodder, and the drain upon labor for armies have all contributed to a lessened milk supply. Of the countries now under control of the

TABLE VIII

EXPORTS OF BUTTER AND CHEESE

Millions of Pounds. Average 1911-1913 of Leading Countries

	<i>Butter</i>	<i>Cheese</i>	<i>Total</i>
Holland	71	130	201
Denmark	200	...	200
Australia and New Zealand	116	61	177
Russia	167	8	175
Canada	4	157	161
Italy	8	67	75
Switzerland	...	70	70
France	36	30	66
Sweden	48	...	48
United States	5	6	11
Argentina	8.3	...	8
Bulgaria	...	5	5
Total—World	710	548	1,258

TABLE IX

IMPORTS OF BUTTER AND CHEESE

Millions of Pounds. Average 1911-1913 of Leading Countries

	<i>Butter</i>	<i>Cheese</i>	<i>Total</i>
United Kingdom	451	253	704
Germany	122	50	172
France	16	49	65
United States	...	50	50
Belgium	15	32	47
Austria-Hungary	10	13	23
Switzerland	12	8	20
Italy	...	12	12
Argentina	...	10	10
Canada	6	...	6
Denmark	6	...	6
Total—World	697	539	1,236

Central Powers, Germany, Austria and Belgium were all large importers of butter and cheese. These supplies were obtained principally from Russia and the neighboring neutral countries, particularly Denmark, Holland, Sweden and Switzerland. During the war, butter and dairy products have been the chief, practically the only, foodstuffs, that the neutral countries could supply the Central Powers. But the grain shortages and the decreased ability to import the usual amounts of cattle food have greatly curtailed dairy production in these neutral countries as well as among the warring nations.

With the usual supply of butter from Russia cut off, combined with the decreased production at home and among the neighboring neutral countries, the western allies are demanding more and more butter, cheese and condensed milk from extra-European countries. Before the war, 451,000,000 pounds of butter, 65 per cent of the world's imports, were brought into the United Kingdom, although the production of the United Kingdom itself was very large. This, combined with an import of 253,000,000 pounds of cheese and a very large import of condensed milk, made the United Kingdom by far the largest importer of dairy supplies. How this demand is now put upon countries outside of Europe is indicated by the growth of exports of dairy products from the United States as shown in Table X.

TABLE X

EXPORTS OF BUTTER, CHEESE AND MILK FROM UNITED STATES

	<i>Butter (lbs.)</i>	<i>Cheese (lbs.)</i>	<i>Condensed Milk (lbs.)</i>
1913	3,585,600	2,599,058	16,525,918
1916-1917	26,835,092	66,087,213	259,102,213

The importance of milk and its products as a food for western nations is exceedingly great, especially when we consider the relation of the milk supply to the strength and development of children. A real danger of shortage of this food faces the nations today, both in Europe and in the United States, unless immediate steps are taken looking toward the increase in dairy cattle.

Fish. The catching of food fish is almost universal, and since fishing is practiced by the individual on a small scale with rod along the brook as well as by great fishing fleets upon the high seas, it is very difficult to even roughly estimate the amount of food thus supplied. In Japan fish is a staple article of diet of first-class importance. But even here the grains and vegetables are very much more important. In most other countries fish is relatively of very small importance. One writer¹⁷ states that the fish catch in the United States is not one-fifth as valuable as the butter produced, and that the fish of all the world are only two-thirds as valuable as the poultry and egg production of the United States. Nevertheless, fish is an article of diet of no mean importance in several countries in Europe, as is shown by Table XI.

TABLE XI

PER CAPITA CONSUMPTION OF FISH

	<i>Pounds</i>		<i>Pounds</i>
United Kingdom	41.4 (1913)	Norway	140.9 (1915)
France	14.2 (pre-war)	Sweden	44.3 (1914)
Germany	19.1	Holland	15.4 (1913)
Denmark	26.5 (1913)	United States	21.2 (1908)

In the Scandinavian countries, Denmark and United Kingdom, fish was of considerable more importance than in France, Holland or Germany. That the problem of securing fish supplies is now more difficult is to be expected from the naval activities in the North

¹⁷ J. R. Smith, *Industrial and Commercial Geography*, p. 324.

Sea and surrounding waters. The estimated fish production of the United Kingdom for 1917 is placed at 8,000,000 cwt. or less than one-third the production of 1913. French production for 1917 will be one-third that of pre-war production; Germany secured three-fourths of her fish produced from the North Sea before the war and in addition imported large quantities. It would be safe to estimate Germany's fish production for 1917 as probably not over half of the pre-war production. On the other hand, Sweden, Holland and Denmark have increased their fish production in the last three years, and Norway's production has remained nearly stationary.¹⁸

CONCLUSION

The outstanding fact in reviewing the food supply of the world is the importance of Europe as an agricultural and grazing region. In spite of Europe's small area, great industrial development and large population, it is the greatest agricultural region of the world. Here are produced the largest supplies of wheat, rye, barley, oats, potatoes, sugar, meats and dairy products, and many other of the important foods of man. In 1913, 65.4 per cent of the world's total production of wheat, oats, rye and barley were grown in Europe; 90.5 per cent of the world's potato crop; 43 per cent of the world's sugar; 18 per cent of the world's corn; 31.8 per cent of the world's cattle. With the exception of rice, millet and corn, Europe leads the world in the production of most of the great staple articles that feed mankind. In spite of this enormous production, Europe is the chief importer from the outside world of foodstuffs and other supplies, like fertilizer and fodder, that are used in producing foods. With the disorganization of the agricultural life occasioned by the war, both in Europe and outside of Europe, with the great demand upon the ship tonnage of the world, needed for war purposes and decreasing as the ravages of the submarine continue, with the actual destruction of large amounts of foods by the destructive agencies of war on land and the sinking of food ships on the sea, the provisioning of Europe is a serious problem. So big is it, indeed, that the food resources of all the world, under existing organization, are being strained to the utmost to meet the needs.

¹⁸ Information in regard to fish is from Robert W. Woodbury, personal communication.